



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest and Alaska Fisheries Center
Resource Assessment and Conservation
Engineering Division
7600 Sand Point Way Northeast
BIN C15700, Building 4
Seattle, Washington 98115-0070

March 29, 1988

F/NWC1:HHS

CRUISE RESULTS
Chartered R/V Alaska
Cruise No. 87-3

Young-of-the-Year Cruise in the Western Gulf of Alaska

CRUISE PERIOD AND AREA

From August 12 to September 20, 1987, scientists from the Northwest and Alaska Fisheries Center (NWAFC) carried out the 1987 young-of-the-year cruise aboard the chartered research vessel Alaska. The area surveyed extended from Unimak Pass (165°W.) to Afognak Island (152°W.), including the Shumagin Islands, Shelikof Strait, and Kodiak Island (Figure 1).

OBJECTIVES

The principal objectives of the 1987 young-of-the-year cruise were to (1) determine the distribution of the 1987 year class of walleye pollock (presumably from the Shelikof Strait spawning) and (2) obtain biological information, specimens, and water temperature data relevant to the distribution of young-of-the-year walleye pollock.

GEAR

The sampling gear used in the young-of-the-year cruise was the 61-foot high opening shrimp trawl augmented with a 1/8" mesh liner in the cod end. Three 30-fathom bridles extended from each wing of the trawl to 6' x 9' steel V-doors. Two adaptations of this basic trawl were employed; for bottom sampling it was fished with a tickler chain and height regulating chains that held the footrope 30 cm off bottom, and for sampling off bottom, the trawl was used without the tickler and height regulating chains, but an 800-pound weight was attached to each lower corner of the mouth to hold it open.



The effective opening of the bottom sampling version of the 61' high opening shrimp trawl has been determined to be 9.8 meters wide and 3.8 meters vertically. During midwater trawling, the fishing depth was determined by means of a BEN-MAR net monitor, an echo sounder attached to the trawl headrope that transmits information to a readout on the ship.

Acoustical data were collected during transects of the survey area by means of a Simrad Skipper 810 echo sounder (35 kHz) interfaced to a Simrad CS-116 color echo sounder.

METHODS

The area for the 1987 young-of-the-year pollock survey was generally designated as downstream from the known pollock spawning area in Shelikof Strait, but no fixed boundaries were established. A survey of pollock larvae conducted by NAWFC personnel from the R/V Miller Freeman during June and July suggested that the area to the west of the Shumagin Islands was a likely place to encounter the juvenile pollock during August and September. The fall survey began at Sand Point in the Shumagin Islands, ranged westward to Unimak Pass and thence eastward to Afognak Island (152°W. Long.).

The basic survey design was to have the vessel proceed along north-south transect lines at 30' of longitude (17 nautical mile) intervals to a depth of approximately 200 m while the ship's echo sounder system was monitoring targets that might be concentrations of young-of-the-year pollock. Such targets were usually strong echos in one or more layers or in broken cloud-like clusters.

During the survey, which was conducted only during daylight hours, the black and white strip recorder of the Skipper 810 echo sounder and the color display of the CS-116 instrument were monitored continuously. To provide documentary records of the survey, the paper strip record was annotated every 15 minutes with a time mark and depth scale information. On the same 15-minute schedule, an entry was made with a hydroacoustic log book describing the time, position, and color composition with reference to depth of the display on the color scope (Figure 2).

Targets observed on the echo sounder and which were judged to be young pollock were sampled by means of the 61-foot shrimp trawl. The standard sample was to tow for 15 minutes at 2.5-3.0 K towing speed. Catches were sorted into species components which were weighed and counted. Walleye pollock were classified on the basis of length into 0-age (young-of-the-year), 1-year olds, 2-year olds, and older specimens. Samples of each age category were measured for length composition.

After the return of the Alaska to Seattle, the CS-116 color scope was calibrated to permit the recorded color composition data records made during the hydroacoustical survey to be converted to estimates of the relative biomass density encountered. The color of the echo return displayed on the CS-116 scope varies in response to the strength of the voltage produced by the transducer from the sound energy reflected by the biomass; the more dense the biomass, the greater the returning echo. The calibration was made with a variable voltage generator, and the range of voltage that produced each color was determined as shown in Columns 1-3, Table 1. A midrange voltage (mean volts, Column 4) was determined for each color, and the relative strength of the mean volts for each color was calculated in Column 5 (Norm. volts). Thus, the numbers in Column 5 are estimates of the density of the biomass being subject to sonification relative to the no-target background (royal blue).

RESULTS

The R/V Alaska was engaged in the survey for juvenile pollock from August 12 to September 20, 1987, a period of 40 days. During this period, survey activities were conducted on 36 days; 2 days were spent in port for personnel exchange, refueling, and resupply; 1 day was spent in transit; and 1 day was lost to weather. A total of 3,030 nautical miles of hydroacoustical transects was monitored within the survey area.

The color scope observations made during the hydroacoustical transects and the relative voltage strength associated with each color were combined to produce a chart of the survey area showing the distribution of relative biomass density of young pollock and other species within the survey area (Figure 3). The relative biomass density is a summary of all echo returns recorded in the hydroacoustic log book (Figure 2). The principal area of biomass concentration was from the Shumagin Islands (159°W.) westward to Unimak Pass (165°W.); other areas of biomass strength were scattered along the south side of the Alaska Peninsula and in the bays and straits of Kodiak and Afognak Islands. Except for the bays and near shore areas along the south side of the Alaska Peninsula, there was little biomass in Shelikof Strait or in the offshore area between Kodiak Island and the Shumagin Islands.

Targets, usually strong echo returns within a limited depth interval, were sampled with the 61-foot shrimp trawl. During the cruise 119 trawl hauls were attempted of which 115 were deemed successful; 109 of the successful tows were made with the midwater trawl and 6 with the bottom trawl. Four failed trawl hauls were unsuccessful because of malfunctions in the netsonde which led to the midwater trawl missing the target depth.

Of the 115 shrimp trawl samples collected during the survey to identify echo sounder targets, nearly one-third contained no 0-age pollock or only traces (no more than one individual per minute of trawling). More than half the trawl samples contained either moderate numbers (101-1,000 individuals) or large numbers (1,001-3,636 individuals) per 10 minutes, as shown below:

Number of 0-age pollock per 10 minutes	Number of trawl samples			
	Bottom	Midwater	Total	(%)
0	0	21	21	(18)
1-10	1	15	16	(14)
11-100	2	13	15	(13)
101-1,000	1	37	38	(33)
1,001-3,636	2	23	25	(22)
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TOTAL:	6	109	115	(100)

Species that appear to present an echo sounder target similar to young-of-the year pollock include jellyfish, older pollock, capelin, and juvenile herring. An examination of the relationship between the relative biomass measurements generated by the hydroacoustical survey and the composition of the trawl catch is anticipated at a later time.

The density of the catches of 0-age pollock, standardized to the number per 10 minutes of towing, suggests that a large patch of young was present from the Shumagin Islands westward to Sanak Island and Unimak Pass. A second patch of 0-age pollock was located near Chignik Bay and Kujulik Bay. Isolated concentrations of 0-age pollock were found in various bays in the vicinity of Kodiak Island and Afognak Island. Few or no 0-age pollock were captured in the offshore area between Kodiak Island and the Shumagin Islands, in Shelikof Strait, off the southeast coast of Kodiak, or in Marmot Bay (Figure 4). The majority of 0-age pollock found in the main patch and the secondary patch were schooled at depths between 14 and 37 fathoms (26-28 meters).

The length range for 0-age pollock encountered was from 3 to 12 cm. Modal length of the 0-age pollock samples increased from 6 cm at the beginning of the cruise to 8 and 9 cm near the cruise end.

Water temperature profiles were collected at the location of trawl fishing stations during the survey. The temperatures at fishing depths ranged from 4° to 12° C., but the larger catches of 0-age pollock (21 catches with more than 1,000 individuals per 10 minutes of trawling) were confined to a range of water temperatures between 5.8° and 9.8° C., and most of these catches (16) were taken within a range of temperatures between 7.0° and 8.7° C.

The 1987 young-of-the-year cruise included a cooperative effort involving other investigators from both within and without the NWAFC. A scientist from the Smithsonian Institution in Washington, D.C., participated in part of the cruise and collected specimens for that agency. Representatives from the Fish Pathology group at the NWAFC were present to collect and preserve materials for their studies of the status of health of pollock in the Gulf of Alaska. Specimens of 0-age pollock were taken throughout the survey area and preserved for studies of age and growth at the NWAFC.

SCIENTIFIC PERSONNEL

Leg I - August 12-30, 1987

Herbert Shippen	NWAFC	Field Party Chief
Christie Johnson	NWAFC	Biological Technician
Allen Kimball	NWAFC	Fishery Aid
Lana Ong	Smithsonian Institution	Museum Aid
Frank Morado	NWAFC	Fishery Biologist

Leg II - August 31-September 20, 1987

Herbert Shippen	NWAFC	Field Party Chief
Therese Armetta	NWAFC	Fishery Biologist
Christie Johnson	NWAFC	Biological Technician
Robert Loghry	NWAFC	Biological Technician
Larry Ratte	NWAFC	Fishery Aid

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Table 1.--Color scope voltage inputs, R/V Alaska Cruise 87-3.

<u>Color produced</u>	Range (volts)		<u>Mean volts</u>	<u>Norm. volts</u>
	<u>Min.</u>	<u>Max.</u>		
Royal blue	0.000	0.031	0.016	1.000
Dark blue	0.031	0.070	0.051	3.158
Light blue	0.070	0.159	0.115	7.387
Light green	0.159	0.345	0.252	16.258
Dark green	0.345	0.680	0.513	33.065
Yellow	0.680	1.360	1.020	65.806

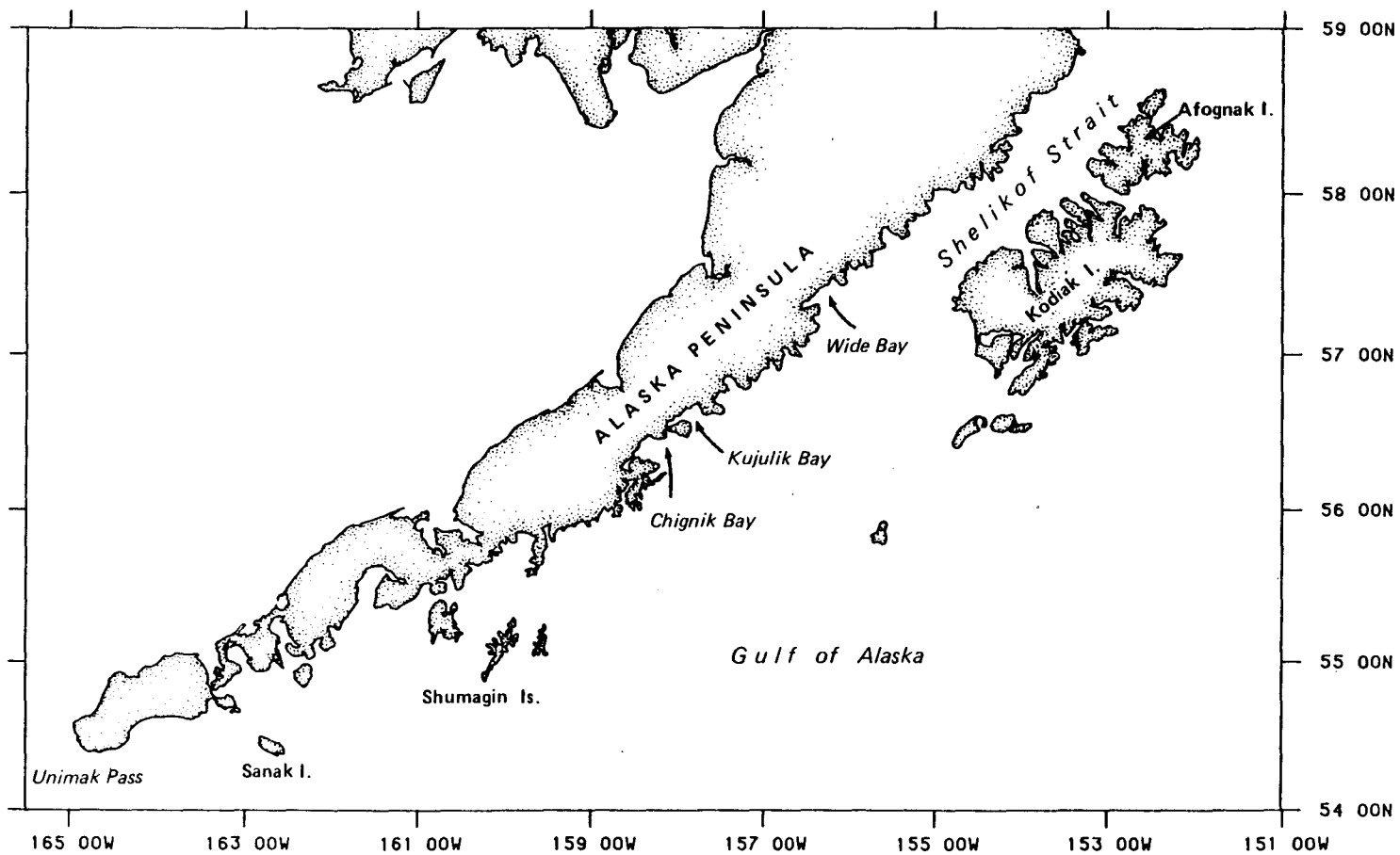


Figure 1.--Area of the Gulf of Alaska included in the 1987 young of the year survey of walleye pollock, R/V ALASKA Cruise 87-3. August 12-September 20, 1987.

COMPLETE IN BIOMETRICS UNIT:				DATE	PROGRAM	PROJECT	ACCOUNT NUMBER	SUBMITTED BY	NUMBER OF CARDS IN JOB	SHEET NO. OF																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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Figure 2.--Example of the log book entries describing the color scope display during hydroacoustic transects. R/V ALASKA Cruise 87-3. August 12-September 20, 1987.

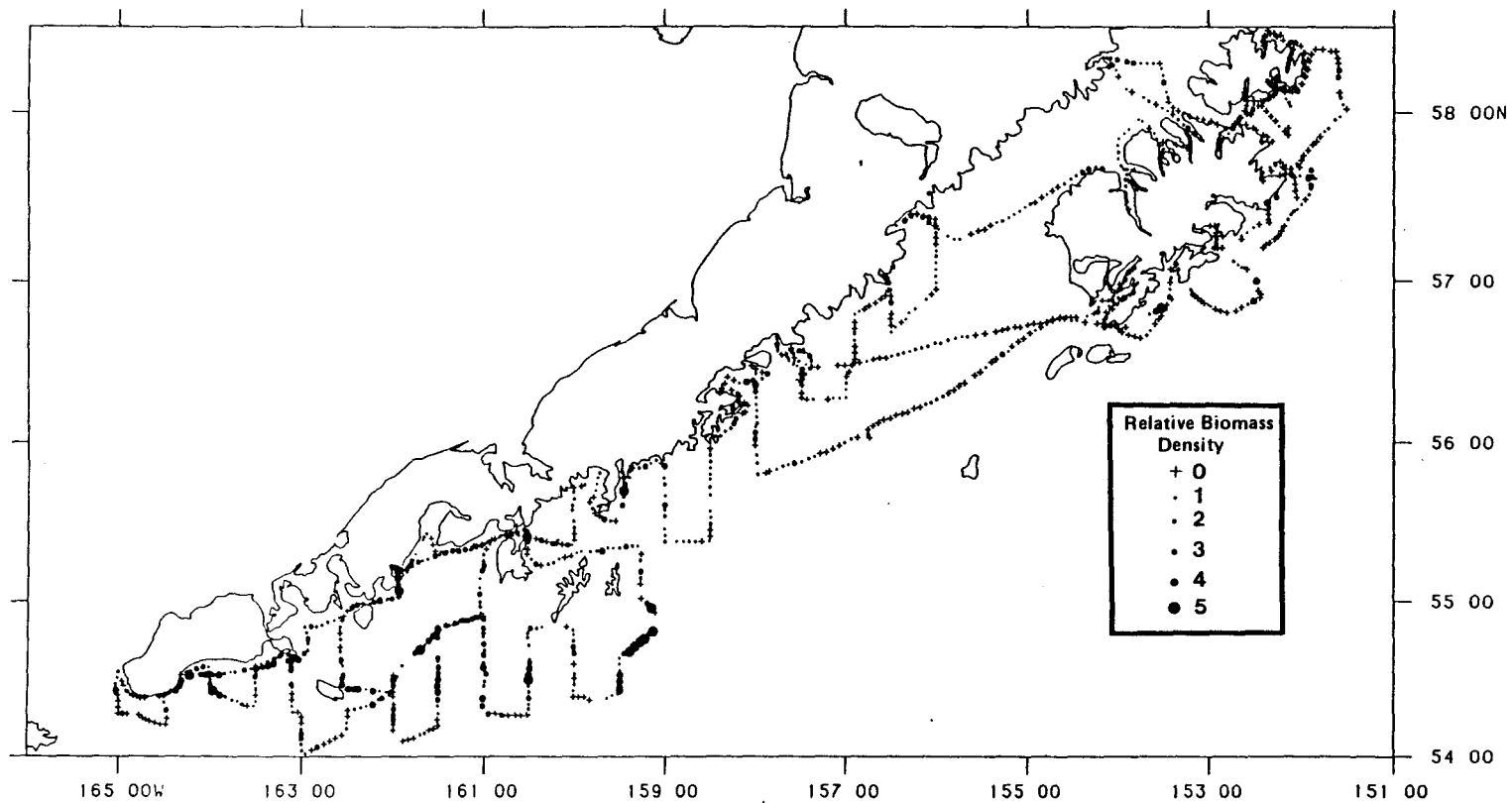


Figure 3.--Compilation of the relative strength of echo returns from the color scope display record. R/V ALASKA Cruise 87-3. August 12-September 20, 1987.

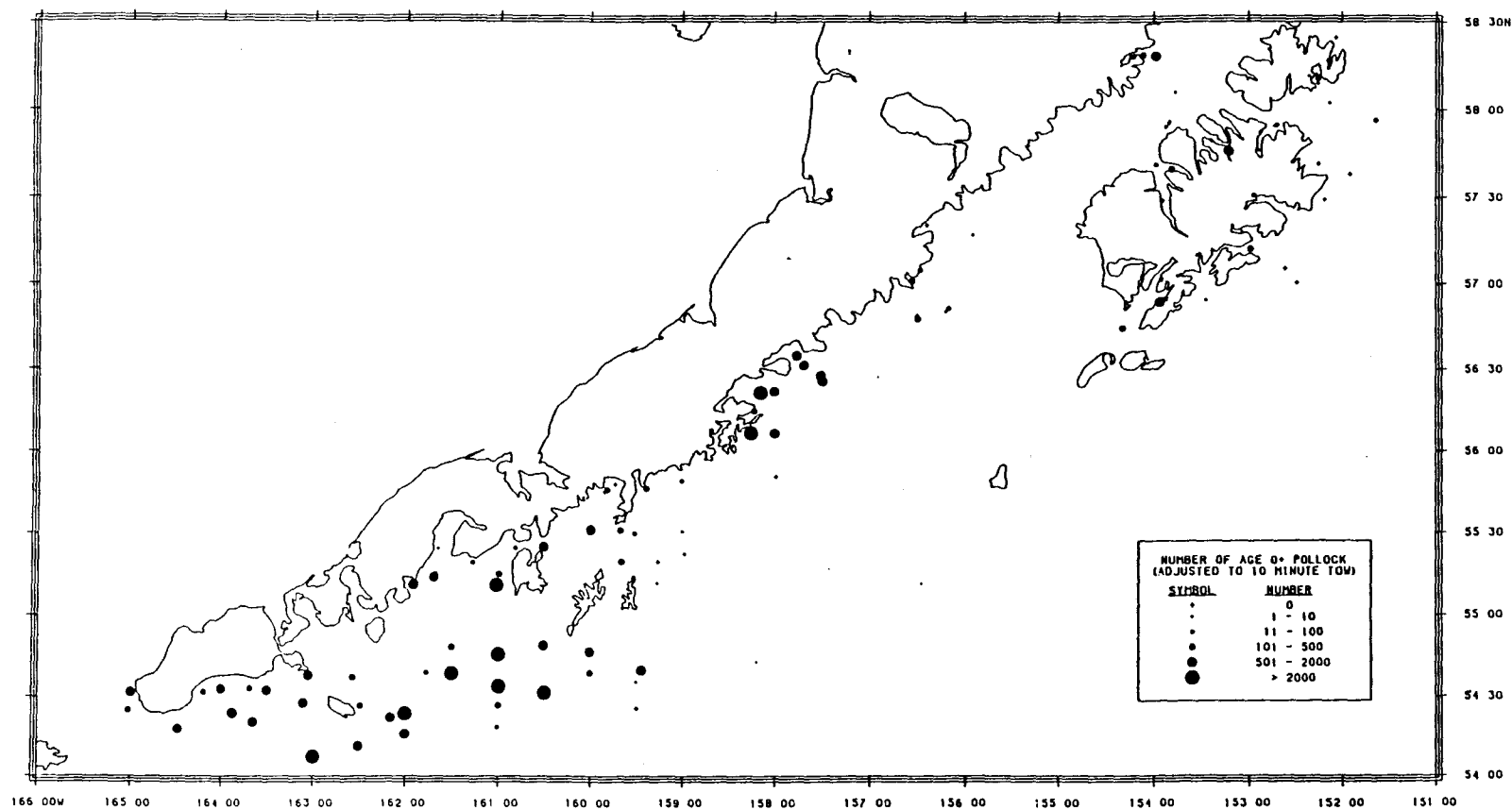


Figure 4.--Number of young of the year (0-age) walleye pollock per ten minutes of trawling. R/V ALASKA Cruise 87-3. August 12-September 20, 1987.